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LISTS OF SPECIES

Rotifers (Rotifera: Eurotatoria) from wetlands of Majuli – the largest river island, the Brahmaputra river basin of upper Assam, northeast India

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ABSTRACT: Plankton samples collected from the floodplain lakes (beels) and small wetlands (dobas or dubies) of Majuli, the largest river island of the world and a unique fluvial landform of the Brahmaputra river basin of northeast India, reveal 131 Rotifera species belonging to 33 genera and 17 families. Two Australasian (Australian & Asian), four Oriental, six Palaeotropical and one Holarctic species are biogeographically interesting elements; one species is a new record to India while several species are of regional interest. The rotifer fauna is predominantly tropical indicating high richness of cosmopolitan species and important contribution of tropicopolitan and pantropical species. Lecanidae > Lepadellidae are the most diverse families; *Lecane* Nitzsch > *Lepadella* Bory de St. Vincent > *Trichocerca* Lamarck are species-rich genera. The rotifers communities are characterized by several small-sized littoral-periphytic taxa, paucity of the Brachionidae in general and rare occurrence of species of *Brachionus* Pallas, *Keratella* Bory de St. Vincent, *Filinia* Bory de St. Vincent, *Asplanchna* Gosse and *Polyarthra* Ehrenberg in particular.

INTRODUCTION

Majuli, commonly called 'Majoli' (land in the middle of two parallel rivers) is the largest river island of the world, situated in the upper reaches of the river Brahmaputra in Upper Assam region of northeast India. It is an interesting region made up purely of fluvial geomorphology which arose from the Brahmaputra basin after a catastrophic flood in 1750 and in course of time turned into a flat-level alluvial plain. It is, therefore, a unique geographical occurrence and a result of the dynamics of this vast river system. This hotspot for flora and fauna and an important cultural heritage site is alarmingly shrinking due to erosion, with about 33% of its landmass eroded in the latter half of 20th century; if this trend continues this island may cease to exist on the world map. Majuli is dotted with wetlands ranging from small *dobas* or *dubies* to several floodplain lakes (*beels*) which contribute notably to its socio-economy through their significant fishery potential.

The present study, a part of our pioneering limnological survey of the Majuli River Island, documents faunal diversity of planktonic and littoral-periphytic Rotifera. This study merits special biodiversity value in light of the hypothesis on the floodplain lakes of the Brahmaputra river basin to be one of the globally rich habitats for Rotifera (Sharma 2005; Sharma and Sharma 2008, 2012). We present here a list of rotifer species examined from plankton samples collected from several wetlands of Majuli. Comments are made on nature and composition of the fauna, occurrence of interesting elements and distribution of different species.

MATERIALS AND METHODS

This study is based on plankton samples collected on many occasions during 2010-2012, from the littoral and limnetic regions of 20+ floodplain lakes (*beels*) and 30+ small wetlands (*dobas* or *dubies*) of Majuli River Island (Long.: 93°–95° E, Lat.: 25°–27° N), upper Assam (Figure 1). Sampled beels are indicated in Table 1.

The collections were made by towing plankton net (# 50 µm) and were preserved in 5% formalin. All the samples were screened, rotifers were isolated and mounted in polyvinyl alcohol-lactophenol mixture, and observed with Leica (DM 1000) stereoscopic phase contrast microscope fitted with an image analyzer. The different taxa were identified based on Koste (1978), Segers (1995) and Sharma and Sharma (1999, 2000, 2008). The reference collections (NEHU/BKS/Assam-Majuli: 1 - NEHU/BKS/Assam-Majuli: 180) are deposited in the holdings of Freshwater Biology Laboratory, Department of Zoology, North-Eastern Hill University, Shillong.

RESULTS

One hundred and eighty samples collected from Majuli River Island reveal a total of 131 species, belonging to 33 genera and 17 families (Table 2). *Lepadella vandenbrandei* Gillard (Figure 2 A) is a new record from India. *Brachionus dichotomus reductus* Koste & Shiel (Figure 2 B) and *B. kostei* Shiel (Figure 2 C) are Australasian species, while *Keratella edmondsoni* Ahlstrom (Figure 2 D), *Lecane blachei* Berzins (Figure 2 E), *L. niwati* Segers, Kotethip & Sanoamuang (Figure 2 F), and *Filinia camasecla* Myers (Figure 2 G) are Oriental endemics. In addition, *Lecane rhytida* Harring & Myers (Figure 2 H) and *L. undulata* Hauer (Figure 2 I) are recent new additions to Indian Rotifera (Sharma and Sharma in 2014b).

DISCUSSION

The higher rotifer biodiversity (131 species) observed in the sampled floodplains indicates rich and diverse nature of Majuli Rotifera. These comprise ~34.0% and

~55.0% of species of the Phylum known till date from India and northeast India, respectively. The rotifer richness reported from this limited geographical area forms a significant fraction (~60.0%) of total species recorded from floodplains of the state of Assam (Sharma and Sharma 2014a) and also compares well with 155 species reported from the floodplain lakes (*pats*) of Manipur (Sharma 2009). The Paleotropical *Lepadella vandenbrandei* is an interesting addition to the rotifer fauna of India. The documented diversity reflects environmental heterogeneity of the sampled *beels* and *dobas* or *dubies* and affirms the hypothesis on floodplain lakes of northeast India as Rotifera rich habitats of the Indian sub-region (Sharma 2005; Sharma and Sharma 2008, 2012). Our results also support the hypothesis of Segers *et al*. (1993) on the rich rotifer diversity of (sub) tropical floodplain lakes.

The occurrence of two Australasian (Australian & Asian) taxa namely *Brachionus dichotomus reductus* Koste & Shiel and *B. kostei* Shiel, a noteworthy feature of this study, supports our remarks (Sharma 2005; Sharma and Sharma 2005, 2008, 2012) on the affinity of Rotifera of northeast India with those of Southeast Asia and Australia. Segers (2001) remarked on the occurrence of the *reductus* vicariant of *B. dichotomus* outside Australia, hypothesizing the recent expansion of these populations to Southeast Asia with Australia as possible origin of this taxon. The report of this vicariant from upper Assam region supports Segers's hypothesis. *B. dichotomus reductus* is known till date from India exclusively from the states of Assam and Tripura of its northeast region. *B. kostei* was first known from India, Assam state (Sharma 2004); this second Indian report also affirms its occurrence restricted to northeast India. Besides, Majuli collections are characterized by four Oriental endemics: *Keratella edmondsoni* Ahlstrom, *Lecane blachei* Berzins, *L. niwati* Segers, Kotethip & Sanoamuang, and *Filinia camasecla* Myers; the last two species are found in India only in its northeast region while *K. edmondsoni* and *L. blachei* exhibit disjunct distribution in this country (Sharma and Sharma 2013). Of the members of these two categories, the reports of *B. kostei* and *F. camasecla* beyond their classical distribution limits: i.e., north-east China and Panama, respectively are possible examples of introduction (Segers 2007).

The occurrence of six Paleotropical species namely *Dipleuchlanis ornata* Segers, *Lepadella discoidea* Segers, *L. vandenbrandei* Gillard, *Lecane lateralis* Sharma, *L. simonneae* Segers and *L. unguitata* (Fadeev), and the Holarctic *Lecane elongata* Harring & Myers are notable features of Majuli Rotifera. The tropical-latitude specimens of the latter may represent glacial relicts as hypothesized by Segers (1996). In addition, *Brachionus diversicornis* (Daday), *Lepadella discoidea*, *L. vandenbrandei*, *Lecane lateralis*, *L. simonneae* and *L. unguitata* are categorized as Eastern Hemisphere species following Savatenalinton and Segers (2005).

Lecane niwati, *L. rhytida* and *L. undulata* are recent additions to the Indian fauna based on the samples examined from Majuli River Island (Sharma and Sharma 2014b). Besides, the collections from Majuli indicate several species of regional distribution importance namely *Lophocharis oxysternon* (Gosse), *Mytilina acanthophora*

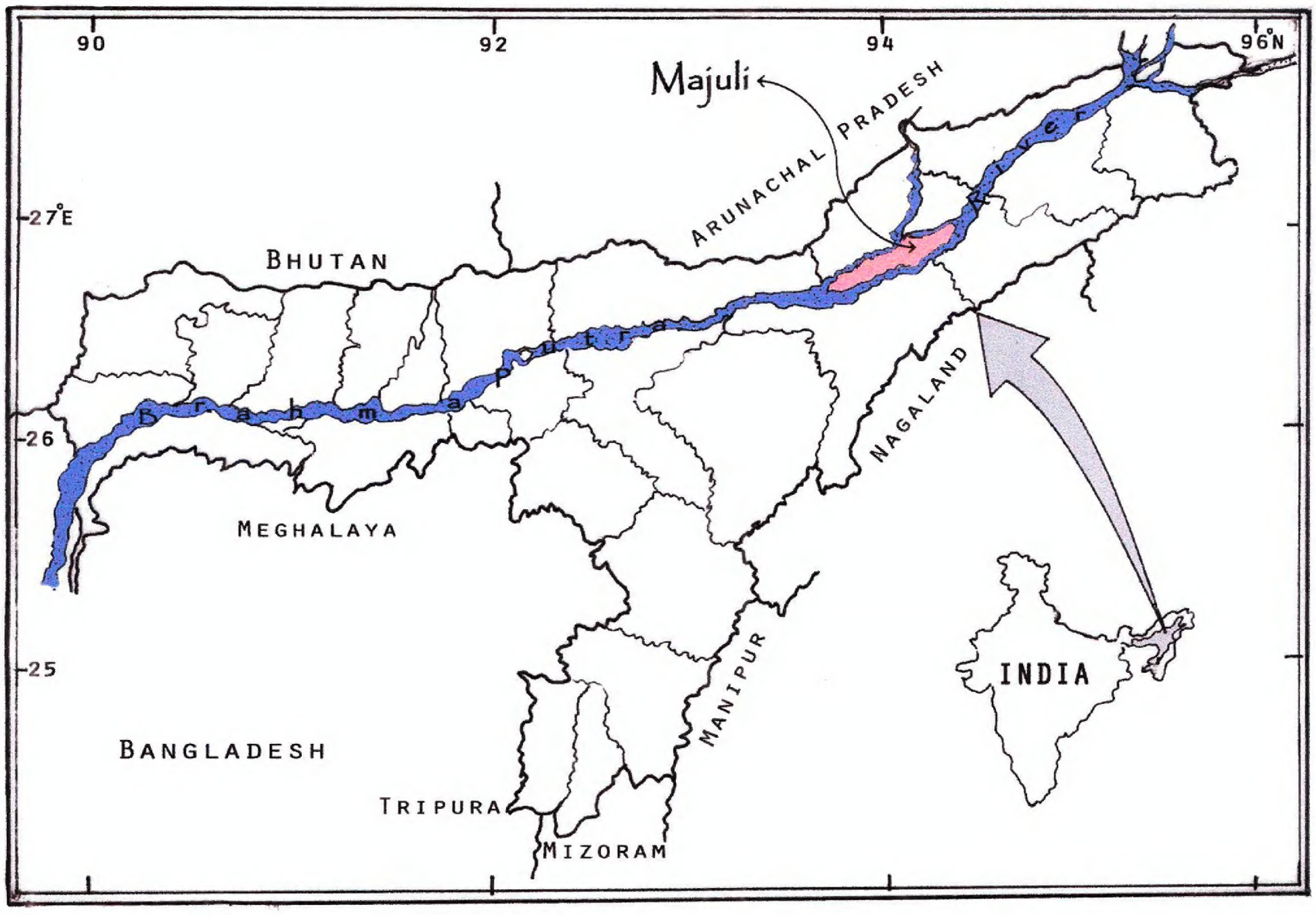

FIGURE 1. District map of Assam state indicating location of Majuli River Island (insert Map of India indicating Assam state of northeast India).

Hauer, *Macrochaetus longipes* Myers, *Lepadella benjamini* Harring, *L. costatoides* Segers, *L. dactyliseta* (Stenroos), *L. elongata* Koste, *L. quinquecostata* (Lucks), *Lecane doryssa* Harring, *L. elongata* Harring & Myers, *L. paxiana* Hauer, *L. pusilla* Harring, *L. monostyla* (Daday), *L. thienemanni* Hauer, *Trichocerca abilioi* Segers & Sarma and *Testudinella tridentata* Smirnov. Of these, *Macrochaetus longipes, Lepadella benjamini, L. dactyliseta, L. elongata, L. quinquecostata, Lecane doryssa, L. elongata, L. pusilla* and *Testudinella tridentata* are observed till date from India only from its northeast region. *Lepadella quinquecostata* represents its second report from northeast India; this species was first examined from this region from Assam state by Sharma (2004).

The richness of Majuli Rotifera is similar to 130 species from Lake Guarana (Bonecker *et al*. 1994) from Brazil and 136 species (Iyi-Efi Lake) from Niger delta (Segers *et al*. 1993). Our report is, however, higher than 111 species reported from the floodplains of Argentina (Jose De Paggi 1993); 124 species (Oguta lake) from Niger delta (Segers *et al*. 1993); 106 taxa from Thale-Noi Lake (Segers and Pholpunthin 1997) and 118 from the river Nan (Sanoamuang 1998), Thailand; 104 species from Laguana Bufeos, Bolivia (Segers *et al.* 1998); and 114 taxa examined from the Rio Pilcomayo National park, Formosa, Argentina (Jose De Paggi 2001), while the diversity is lower than the reports of 151 (Koste 1974) and 148 species from Rao Tapajos and Lago Camaleao (Koste and Robertson 1983), respectively.

Lecanidae (43 species) > Lepadellidae (24 species) are most diverse families while *Lecane* (43 species) > *Lepadella* (20 species) > *Trichocerca* (13 species) are species-rich genera; these families and genera include about 51.0% and 58.0% of the rotifer species observed from Majuli, respectively. Interestingly enough, the relative consistency of the importance of three periphytic monogonont genera indicates the possibility of assemblage rules for the periphytic community as hypothesized by Green (2003). The significance of these taxa, however, concurs with the composition of Rotifera of wetlands from Assam (Sharma and Sharma 2008), northeastern India (B.K. Sharma unpublished) as well as elsewhere from Argentina (Jose De Paggi 1993, 2001), Niger delta (Segers *et al*. 1993), Brazil (Koste 1974; Bonecker *et al*. 1994, 1998), Thailand (Segers and Pholpunthin 1997; Sanoamuang 1998), Bolivia (Segers et al. 1998) and Okavango Delta of South Africa (Green *loc cit*.).

Brachionidae (14 species) and Trichocercidae (13 species) merit attention with caution on over-emphasis of the former as our collections from Majuli are characterized by distinct paucity of the brachionids in general and of *Brachionus* and *Keratella* spp. in particular. This feature is affirmed by the fact that amongst 29, 14 and 9 species of these taxa, respectively known from Assam, only half of the species of each taxon are observed from Majuli. The rarity of *Filinia, Asplanchna* and *Polyarthra* spp. is another notable character of this study.

Majuli Rotifera is characterized by large number of small-sized littoral-periphytonic species particularly of *Anuraeopsis, Colurella, Lecane, Lepadella* and *Trichocerca* as well as low densities (B.K. Sharma unpublished) of majority of species. These interesting features can be attributed to conditions of low concentrations of food (Papinski 1990) and predation by juvenile fish and invertebrates (Baumgartner *et al.* 1997). The former aspect is supported by lower phytoplankton density in the sampled wetlands (B.K. Sharma unpublished) though specific observations are yet desired to confirm predation hypotheses.

Latitudinal variations in the distribution, directly or indirectly induced by climatological factors are well known in Rotifera (Green 1972; De Ridder 1981; Dumont 1983; Segers 1996). Segers (2001) stressed the role of thermophiles in the rotifer fauna of Southeast Asia and indicated the qualitative significance of *Lecane*. This salient attribute is affirmed by species-rich nature of the 'tropic-centered' *Lecane* in our study. Cosmopolitan species show high richness (69.5% of the listed species) while cosmotropical (12.2%) > pantropical (6.1 %) are well represented. The stated features impart a general 'tropical character' to the rotifer fauna of Majuli island; this generalization concurs with the composition of the tropical faunas from different parts of the globe (Green 1972; Pejler 1977; Fernando 1980; Dussart *et al.*1984; Segers 1996, 2001; Sanoamuang 1998; Sharma 1998a, b, 2005; and Sharma and Sharma (2005, 2008, 2012).

The common species observed in this study are: *Plationus patulus, Platyias quadricornis, Euchlanis dilatata, E. triquetra, Dipleuchlanis propatula, Mytilina ventralis, Macrochaetus collinsi, M. sericus, Colurella obtusa, C. uncinata, Lecane aculeata, L. bulla, L. closterocerca, L. curvicornis, L. crepida, L. doryssa, L. furcata, L. hamata, L. leontina, L. ludwigii, L. luna, L. lunaris, L. papuana, L. quadridentata, L. styrax, L. unguitata, L. ungulata,*

Table 1. List of the sampled floodplain lakes (beels) of Majuli River Island.

BEEL	LATITUDE	L°NGITUDE	ALTITUDE
Bhereki Beel*	26°57′09.1″ N	94°12′23.0″ E	67 m ASL
Chela Beel*	27° 04′58.2″ N	94° 17′51.9″ E	89 m ASL
Ghotonga Beel*	27°01′52.7″ N	94°15′28.7″ E	73 m ASL
Holmari Beel*	26°59′17.3″ N	94°12′30.6″ E	75 m ASL
Khorkhoria Beel*	26° 56′47.4″ N	94°12′28.8″ E	74 m ASL
Chakuli Beel*	26°56′40.3″ N	94°09′01.9″ E	69 m ASL
Baatomaari Beel	26°59′25.9″ N	94°13′08.0″ E	71 m ASL
Tuni Beel:	26° 58′35.3″ N	94°15′57.8″ E	67 m ASL
Noldunga Beel	26°58′09.4″ N	94°03′03.4″ E	74 m ASL
Kakorikata Beel	26°57′19.1″ N	94°08′35.7″ E	74 m ASL
Bor Beel	27°05′13.2″ N	94°22′41.8″ E	75 m ASL
Doriya Beel	26°57′27.7″ N	94°10′02.4″ E	70 m ASL
Dighaliya Beel	26°56′15.5″ N	94°03′45.7″ E	68 m ASL
Lingri Beel	26°57′02.7″ N	94°05′05.3″ E	69 m ASL
Jur Beel:	26°59′45.3″ N	94°14′34.4″ E	71 m ASL
Puronibaari Beel	26°59′23.7″ N	94°11′16.8″ E	96 m ASL
Chereki Beel	26°58′25.4″ N	94°10′38.7″ E	67 m ASL
Gukhai Beel	26°57′07.0″ N	94°09′04.2″ E	70 m ASL
Baalichapori Beel	26°55′42.0″ N	94°02′44.7″ E	75 m ASL
Mohorichuk Beel	26°55′40.4″ N	94°01′47.7″ E	89 m ASL
Dubori Beel	26°57′01.9″ N	94°16′13.8″ E	70 m ASL
Karatipar Beel	26°56′39.4″ N	94°04′13.5″ E	74 m ASL

* Sampled monthly between August 2010-July 2011 while 30+ dobas or dubies were sampled randomly during winter (December/January), pre-monsoon (March-May), monsoon (June-August) and post-monsoon (September-October) between August 2010-July 2012.

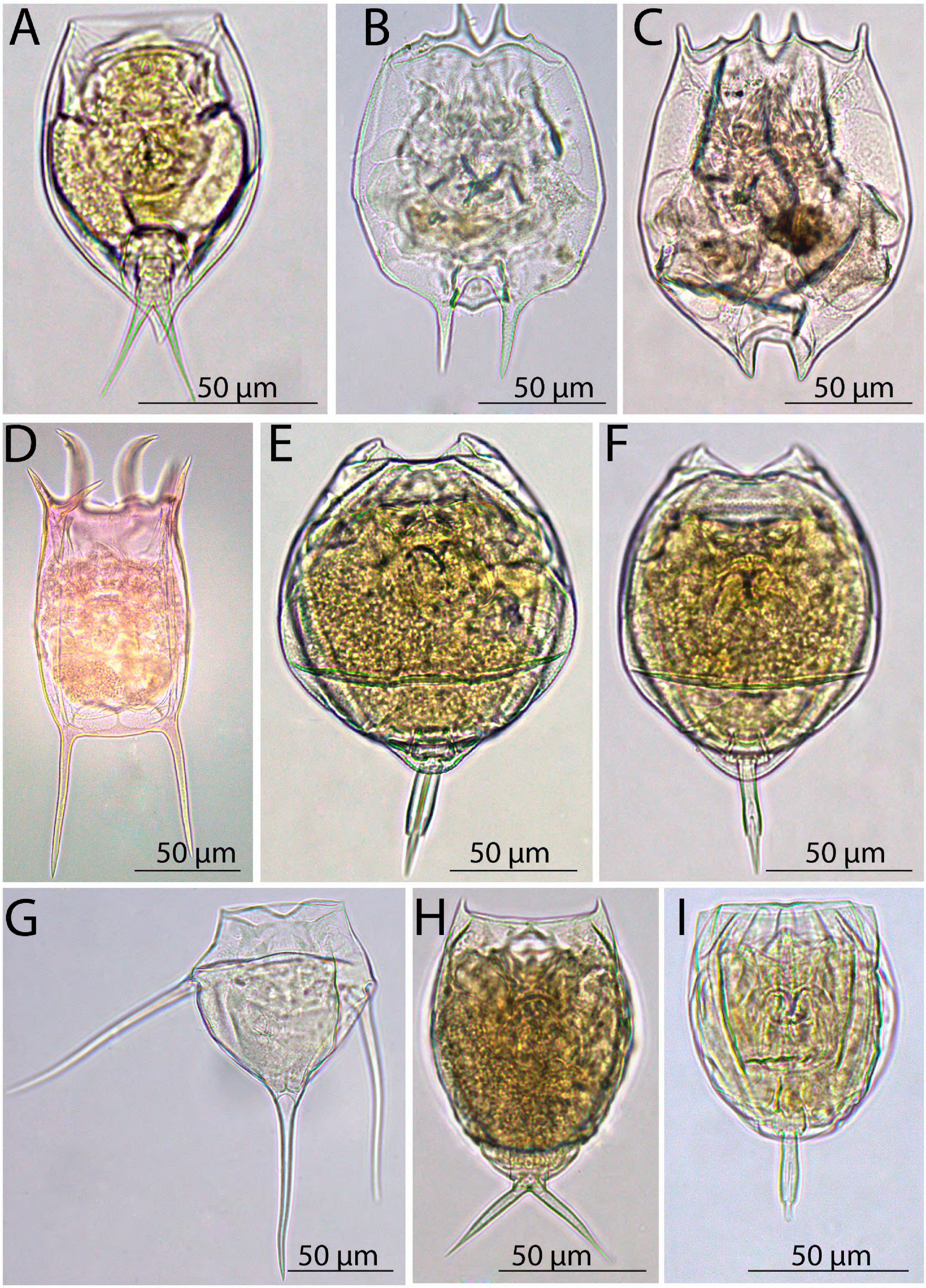

Figure 2. A-I. Species of Rotifera. A: *Lepadella vandenbrandei* Gillard, 1952. B: *Brachionus dichotomus reductus* Koste & Shiel, 1980. C: *Brachionus kostei* Shiel, 1983. D: *Keratella edmondsoni* Ahlstrom, 1943. E: *Lecane blachei* Berzins, 1973. F: *Lecane niwati* Segers, Kotethip & Sanoamuang, 2004. G: *Filinia camascela* Myers, 1938. H: *Lecane rhytida* Harring & Myers, 1926. I: *Lecane undulata* Hauer, 1938.

Scaridium longicaudum, Sinantherina spinosa, Trichocerca bicristata, T. rattus, Testudinella emarginula and *T. patina*. Besides, *Brachionus calyciflorus, B. dichotomus reductus, B. diversicornis, B. falcatus, B. mirabilis, Keratella edmondsoni, Dipleuchlanis ornata, Filinia camasecla, F. longiseta, Lophocharis oxysternon, Lepadella elongata, L. minuta, Lecane elasma, L. elongata, L. lateralis, L. nitida, L. niwati, L. paxiana, L. pertica, Notommata pachyura, Pompholyx sulcata, T. cylindrica, T. elongata, Asplanchna priodonta, Polyarthra vulgaris, T. tridentata* and *Trochosphaera aequatorialis* exhibit rare occurrence.

To conclude, Rotifera fauna of Majuli is rich in species, with several elements from global and regional biogeographical interest. The fauna depicts general tropical character, predominance of non-planktonic littoral-periphytic species, distinct richness of `tropic-centered′ *Lecane*, several small-sized species, distinct paucity of the Brachionidae, and rare occurrence species of *Brachionus, Keratella, Filinia, Asplanchna* and *Polyarthra*. Our collections are biased towards planktonic and semi-planktonic monogonont taxa while the sampling of benthic, sessile and bdelloids is desired to up-date the species inventory. The rotifer associations with different aquatic macrophytes in wetlands as well as the flushing influence of the Brahmaputra flood waters during monsoon via-a-vis rotifer assemblage and their subsequent re-colonization merit special study due to lack of such works from India.

Table 2. Systematic list of Rotifera species recorded from Majuli.

Phylum Rotifera
Class Eurotatoria
Subclass Monogononta
Order Ploima
Family Brachionidae
Anuraeopsis fissa Gosse, 1851
Brachionus angularis Gosse, 1851
B. calyciflorus Pallas, 1766
B. dichotomus reductus Koste & Shiel, 1980
B. diversicornis (Daday, 1883)
B. falcatus Zacharias, 1898
B. kostei Shiel, 1983
B. quadridentatus Hermann, 1783
Keratella cochlearis (Gosse, 1851)
K. edmondsoni Ahlstrom, 1943
K. lenzi Hauer, 1953
K. tropica (Apstein, 1907)
Platyias quadricornis (Ehrenberg, 1832)
Plationus patulus (O.F. Muller, 1786)
Family Euchlanidae
Euchlanis dilatata Ehrenberg, 1832
E. incisa Carlin, 1939
E. triquetra Ehrenberg, 1838
Dipleuchlanis ornata Segers, 1993
D. propatula (Gosse, 1886)
Tripleuchlanis plicata (Levander, 1894)
Beauchampiella eudactylota (Gosse, 1886)
Family Mytilinidae
Lophocharis oxysternon (Gosse, 1851)
Mytilina acanthophora Hauer, 1938
M. bisulcata (Lucks, 1912)
M. ventralis (Ehrenberg, 1830)
Family Trichotriidae
Macrochaetus collinsi (Gosse, 1867)
M. longipes Myers, 1934
M. sericus (Thorpe, 1893)
Trichotria tetractis (Ehrenberg, 1830)
Family Lepadellidae
Co*lurella colurus* (Ehrenberg, 1830)
C. obtusa (Gosse, 1886)
C. uncinata (O.F. Muller, 1773)
Lepadella acuminata (Ehrenberg, 1834)
L. apsida Harring, 1916
L. benjamini Harring, 1916
L. biloba Hauer, 1958
L. costatoides Segers, 1992
L. dactyliseta (Stenroos, 1898)
L. discoidea Segers, 1993
L. elongata Koste, 1992
L. eurysterna Myers, 1942
L. latusinus (Hilgendorf, 1899)
L. ovalis (O.F. Muller, 1786)
L. patella (O.F. Muller, 1773)
L. quinquecostata (Lucks, 1912)
L. rhomboides (Gosse, 1886)
L. triptera Ehrenberg, 1832
L. vandenbrandei Gillard, 1952
L. (*Heterolepadella*) *apsicora* Myers, 1934
L. (*H.*) *ehrenbergi* (Perty, 1850)
L. (*H.*) *heterostyla* (Murray, 1913)
Squatinella lamellaris (O. F. Müller, 1786)
Family Lecanidae
Lecane aculeata (Jakubski, 1912)
L. arcula Harring, 1914
L. blachei Berzins, 1973
L. bulla (Gosse, 1851)
L. closterocerca (Schmarda, 1859)
L. crepida Harring, 1914
L. curvicornis (Murray, 1913)
L. decipiens (Murray, 1913)
L. doryssa Harring, 1914
L. elongata Harring & Myers, 1926
L. flexilis (Gosse, 1886)
L. furcata (Murray, 1913)
L. haliclysta Harring & Myers, 1926
L. hamata (Stokes, 1896)
L. hornemanni (Ehrenberg, 1834)
L. inermis (Bryce, 1892)
L. inopinata Harring & Myers, 1926
L. lateralis Sharma, 1978
L. leontina (Turner, 1892)
L. ludwigii (Eckstein, 1883)
L. luna (O.F. Müller, 1776)
L. lunaris (Ehrenberg, 1832)
L. monostyla (Daday, 1897)
L. nitida (Murray, 1913)
L. niwati Segers, Kotethip & Sanoamuang, 2004
L. obtusa (Murray, 1913)
L. ohioensis (Herrick, 1885)
L. papuana (Murray, 1913)
L. paxiana Hauer, 1940
L. ploenensis (Voigt, 1902)

Table 2. ***Continued.***

L. pusilla Harring, 1914	*T. tenuior* (Gosse, 1886)
L. pyriformis (Daday, 1905)	*T. tigris* (O.F. Müller, 1786)
L. quadridentata (Ehrenberg, 1830)	*T. voluta* (Murray, 1913)
L. rhytida Harring & Myers, 1926	*T. weberi* (Jennings, 1903)
L. signifera (Jennings, 1896)	**Family Asplanchnidae**
L. simonneae Segers, 1993	*Asplanchna priodonta* Gosse, 1850
L. stenroosi (Meissner, 1908)	**Family Synchaetidae**
L. styrax (Harring & Myers, 1926)	*Polyarthra vulgaris* Carlin, 1943
L. tenuiseta Harring, 1914	**Family Dicranophoridae**
L. thienemanni (Hauer, 1938)	*Dicranophoroides caudatus* (Ehrenberg, 1834)
L. undulata Hauer, 1938	*D. forcipatus* (O. F. Müller, 1786)
L. unguitata (Fadeev, 1925)	**Order Floscullariaceae**
L. ungulata (Gosse, 1887)	**Family Flosculariidae**
Family Notommatidae	*Sinantherina socialis* (Linne, 1758)
Cephalodella forficula (Ehrenberg, 1830)	*S. spinosa* (Thorpe, 1893)
C. gibba (Ehrenberg, 1830)	**Family Hexarthridae**
Monommata longiseta (O. F. Müller, 1786)	*Hexarthra mira* (Hudson, 1871)
M. maculata Harring & Myers, 1930	**Family Testudinellidae**
Notommata pachyura (Gosse, 1886)	*Testudinella emarginula* (Stenroos, 1898)
Family Scaridiidae	*T. patina* (Hermann, 1783)
Scaridium longicaudum (O.F. Müller, 1786)	*T. tridentata* Smirnov, 1931
Family Trichocercidae	*Pompholyx sulcata* Hudson,1885
Trichocerca abilioi Segers & Sarma, 1993	**Family Trochosphaeridae**
T. bicristata (Gosse, 1887)	*Filinia camasecla* Myers, 1938
T. cylindrica (Imhof, 1891)	*F. longiseta* (Ehrenberg, 1834)
T. elongata (Gosse, 1886)	*Trochosphaera aequatorialis* Semper, 1872
T insignis (Herrick, 1885)	**Sub-class Digononta**
T. insulana (Hauer, 1937)	**Order Bdelloidea**
T. pusilla (Jennings, 1903)	**Family Philodinidae**
T. rattus (O.F. Müller, 1776)	*Philodina roseola* Ehrenberg, 1832
T. similis (Wierzejski, 1893)	*Rotaria neptunia* (Ehrenberg, 1830)
	R. rotatoria (Pallas, 1766)

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Literature Cited

Baumgartner, G., K. Nakataki, M. Cavicchiolo and M.S. Baugartner. 1997. Some aspects of the ecology of fish larvae in the floodplain of the high Parana river, Brazil. *Review Brazilian Zoology* 14: 551–563.

Bonecker, C.C., F.A. Lansac-Tôha and A. Staub. 1994. Qualitative study of Rotifers in different environments of the high Parana river floodplain (Ms), Brazil. *Revista UNIMAR* 16(1): 1–16.

Bonecker, C.C., F.A. Lansac-Tôha and D.C. Rossa. 1998. Planktonic and non-planktonic rotifers in two environments of the upper Parana river floodplain, state of Mato Grosso do Sul, Brazil. *Brazilian Archives of Biology & Technology* 41: 447–456.

De Ridder, M. 1981. Some considerations on the geographical distribution of Rotifera. *Hydrobiologia* 85: 209–235.

Dumont, H. J. 1983. Biogeography of rotifers. *Hydrobiologia* 104: 19–30.

Dussart, B.H., C.H. Fernando, J. Matsumura-Tundisi and R.J. Shiel. 1984. A review of systematics, distribution and ecology of tropical freshwater zooplankton. *Hydrobiologia* 113: 77–91.

Fernando, C.H. 1980. The freshwater zooplankton of Sri Lanka, with a discussion of tropical freshwater zooplankton composition. *Internationale Revue Hydrobiologie* 65(1): 411–426.

Green, J. 1972. Latitudinal variation in associations of planktonic Rotifera. *Journal of Zoology, London* 167: 31–39.

Green, J. 2003. Associations of planktonic and periphytic rotifers in a tropical swamp, the Okavango Delta, Southern Africa. *Hydrobiologia* 490**:** 197–209.

José De Paggi, S. 1993. Composition and seasonality of planktonic rotifers in limnetic and littoral region of a floodplain lake (Parana River System). *Revue d'Hydrobiologie Tropicale* 26(1): 53-64.

José De Paggi, S. 2001. Diversity of Rotifera (Monogononta) in wetlands of Rio Pilcomayo national park, Ramsar site (Formosa, Argentina). *Hydrobiologia* 462: 25–34.

Koste, W. 1974. Zur Kenntnis der Rotatorienfauna der'schwimmenden Weise' einer Uferlagune in der Varzea Amazoniens, Brasilien. *Amazoniana* 5: 25–60.

Koste, W. 1978. *Rotatoria. Die Rädertiere Mitteleuropas, begründet von Max Voigt. Überordnung Monogononta*. Berlin, Stuttgart: Gebrüder Borntraeger. 673 pp.

Koste, W. and B. Robertson. 1983. Taxonomic studies of the Rotifera (Phylum Aschelminthes) from a central Amazonian varzea lake, Lago Camaleao (Ilha de Marchantaria, Rio Solimoes, Amazonas, Brazil). *Amazoniana* 7(2): 225–254.

Papinski, K. 1990. Abundance and composition of rotifers in the Vistula river. *Polish Archives of Hydrobiology* 37: 449–459.

Pejler, B. 1977. On the global distribution of the family Brachionidae (Rotatoria). *Archiv für Hydrobiology, supplement* 53: 255–306.

Sanoamuang, L. 1998. Rotifera of some freshwater habitats in the floodplains of the River Nan, northern Thailand. *Hydrobiologia* 387/388: 27–33.

Savatenalinton, S. and H. Segers. 2005.Rotifers from Kalasin province, Northeast Thailand, with notes on new and rare species. *Zoological Studies* 44(3): 361–367.

Segers, H. 1995. Rotifera 2: Lecanidae. 6; pp. 1–226, in: H.J. Dumont and T. Nogrady (ed.). *Guides to identification of the Microinvertebrates .of the Continental waters of the world*. Amsterdam, the Netherlands: SPB Academic Publishing bv.

Segers, H. 1996. The biogeography of littoral Lecane Rotifera. *Hydrobiologia* 323: 169–197.

Segers, H. 2001. Zoogeography of the Southeast Asian Rotifera.

Hydrobiologia 446/ 447: 233–246.
Segers, H. 2007. Annotated checklist of the rotifers (Phylum Rotifera), with notes on nomenclature, taxonomy and distribution. *Zootaxa* 1564: 1–104.
Segers, H., N.L. Ferrufino and L. De Meester, 1998. Diversity and Zoogeography of Rotifera (Monogononta) in a flood plain lake of the Ichilo river, Bolivia, with notes on little known species. *Internationale Revue Hydrobiologie* 83(5–6): 439–448.
Segers, H., C.S. Nwadiaro and H.J. Dumont. 1993. Rotifera of some lakes in the floodplain of the river Niger (Imo State, Nigeria). II. Faunal composition and diversity. *Hydrobiologia* 250: 63–71.
Segers, H. and P. Pholpunthin. 1997. New and rare Rotifera from Thale Noi Lake, Pattalang Province, Thailand, with a note on the taxonomy of *Cephalodella* (Notommatidae). *Annals Limnologie* 33(1): 13–21.
Sharma, B.K. 1998a. Faunal Diversity in India: Rotifera; p.p 57–70, in: J.R.B. Alfred, A.K. Das and A.K. Sanyal (ed.). Faunal Diversity of India. Calcutta: ENVIS Centre, Zoological Survey of India.
Sharma, B.K. 1998b. Freshwater Rotifers (Rotifera: Eurotatoria). *Fauna of West Bengal. State Fauna Series* 3(11): 341–461. Zoological Survey of India, Calcutta.
Sharma, B.K. 2004. Rare and interesting monogonont rotifers (Rotifera, Eurotatoria) from North-Eastern India. *Mitteilungen aus dem Museum für Naturkunde Berlin, Zoologische Reihe* 80(1): 33–40.
Sharma, B.K. 2005. Rotifer communities of floodplain lakes of the Brahmaputra basin of lower Assam (N. E. India): biodiversity, distribution and ecology. *Hydrobiologia* 533: 209–221.
Sharma, B.K. 2009. Rotifer communities of floodplain lakes of Manipur (North-East India): biodiversity, distribution and ecology. *Journal of Bombay Natural History Society* 106(1): 45–56.
Sharma, B.K. and S. Sharma. 1999. Freshwater Rotifers (Rotifera: Eurotatoria). *State Fauna Series*: *Fauna of Meghalaya* 4(9): 11–161. Calcutta: Zoological Survey of India.
Sharma, B.K. and S. Sharma. 2000. Freshwater Rotifers (Rotifera: Eurotatoria). *State Fauna Series: Fauna of Tripura* 7(4): 163–224. Calcutta: Zoological Survey of India.
Sharma, B.K. and S. Sharma. 2005. Biodiversity of freshwater rotifers (Rotifera: Eurotatoria) from North-Eastern India. *Mitteilungen aus dem Museum für Naturkunde Berlin, Zoologische Reihe* 81(1): 81–88.
Sharma, B.K. and S. Sharma. 2012. Deepor Beel-a Ramsar site of India: an interesting hot-spot with its rich Rotifera biodiversity. *Acta Zoologica Academiae Scientiarum Hungaricae* 58(2): 105–120.
Sharma, B.K. and S. Sharma. 2014a. Northeast India - An important region with a rich biodiversity of Rotifera; pp. 20–37, in: B.K. Sharma, H.J. Dumont and R.L. Wallace (ed.). Rotifera XIII: Rotifer Biology - A structural and functional approach. *International Review of Hydrobiology* 99(1–2).
Sharma, B.K. and S. Sharma. 2014b. Indian Lecanidae (Rotifera: Eurotatoria: Monogononta) and its distribution; pp. 38–47, in: B.K. Sharma, H.J. Dumont and R.L. Wallace (ed.). *Rotifera XIII: Rotifer Biology- A structural and functional approach. International Review of Hydrobiology* 99(1–2).
Sharma, S. and B.K. Sharma. 2008. Zooplankton diversity in floodplain lakes of Assam. *Records of the Zoological Survey of India, Occasional Paper No.* 290: 1–307.
Sharma, S. and B.K. Sharma. 2013. *Faunal Diversity of Aquatic Invertebrates of Deepor Beel* (*a Ramsar site*), *Assam, northeast India.* Wetland Ecosystem Series 17: 1–227. Calcutta: Zoological Survey of India.

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